REMARKS

The Official Action has been carefully considered and the Examiner's comments are duly noted. Reconsideration of this Application, in light of the Amendments for the Claims, is respectfully solicited.

It is noted that a request for a term extension has been included and our check in the amount $210.00 – small entity – for a 2 months extension is enclosed. I have been advised that the applicant/owner is small entity.

Turning now more specifically to the Rejection by the Examiner and specifically, claims 18 to 21 and 25 to 29, which were rejected under 35 USC 1.02(b) as be anticipated by Cavazos, a careful analysis of the Examiner's statements and the portion to which the Examiner referred in the Official Action clearly indicates that Cavazos does not teach what Applicant sets forth.

Claim 18 has been amended so as to restrict the invention to a non-glass product. Therefore, the prior art of Cavazos is not pertinent because it solely applies to glass molding and the problems in connection with glass molding is quite different from the use of dye and plastic material. In any event, in order to distinguish further from Cavazos, claim 18 has been amended so as to set forth in the preamble that the mold is for dyes and molding of articles using dye. Further, claim 18 now calls for a single quantity of liquid.

Note, none of the claims include blind bores and blind bores specifically teach away from the invention.

Claim 19 has been amended so as to set forth that all of the working surfaces of the mold are serviced equally by the liquid, a feature not shown nor suggested by Cavazos.

Claim 20 has been amended so as to set forth that the liquid is water within the space in the chamber above the liquid level. Also, claim 20 specifically excludes water vapor.

Claim 21 was previously amended and clearly is distinguished from Cavazos because it refers to the molding of plastic materials and not glass.

Turning now specifically to claims 25 to 29, these claims have all been amended so as to take it out of the teachings of the glass molding art and place it into the art for mold for dyes and articles using dyes. In addition, claim 25 refers to the use of the same liquid to affect the cooling and condensation of the vapors of the liquid.

With respect to claim 26, reference is now made and limited to the use of the same liquid in the completely closed chamber.

Claim 27 has been amended so as to set forth a single cooling liquid.

Claims 28 and 29 are allowable for the same reasons as claim 25, and further because of the definition of the liquid as water and further that the vapor is water vapor.

Note, Cavazos does not teach heating means in the liquid in the mold, and the mold, according to the invention, is for molding of thermo-forming parts.

With respect to the objection on the issue of obviousness, clearly, it is necessary at this juncture to provide a further comparison between the present invention and

Cavazos. Once this is done, it is believed that the Examiner will appreciate that the inventor's contribution clearly overcomes the prior art whether cited under 102 or 103.

The first issue that would appear to be central to the objections raised is the extent to which the citation Cavazos US5167688 is relevant and indeed whether this patent disclosure does teach a solution to the problem that is the same solution as the present invention. According to the experiments made with the teachings of Cavazos, Cavazos would not work as it has been shown or described. It is not clear that the apparatus of Cavazos may be able to be made to work using the solution of the present invention, and further comments for this purpose are being submitted.

At this time, a copy of a declaration which will be submitted is enclosed. This declarations by the inventor Mr. Malcolm Barry James who is an expert on this complicated technology and will be referred to subsequently.

ANALYSIS OF CAVAZOS

Briefly, Cavazos is addressing the problem of cooling a mold in the glass molding industry.

(Column 1, Lines 10-14)

Glass molds normally operate at temperatures-significantly above the boiling point of water which Cavazos said can be used (column 3, line 5, 6) and therefore in order to increase the boiling point temperature of water, the pressure must be considerably increased above atmospheric pressure within any headspace within the closed areas.

According to the teachings of Cavazos, Cavazos intends that a number of blind bores to be located at distributed places around a half of a mold and each of these blind bores is connected by a conduit to a common manifold where the pipe leading from the respective blind bore extends horizontally and then vertically into a bottom of a circular cross section manifold.

This manifold which is now outside of the mold is then connected by a vertical tube to a condenser, which on figure 1 is 20 and a control valve 26.

The specification in Cavazos does not of itself explain how much water is to be inserted into the system, although it does describe two methods of start up where it says that some water is introduced and then there is a moisture detector so that the valve 26 is then returned to a normally closed position.

Given that there is no specific description as to how much water should be inserted, it is however indicative in both figures 1 and 2 that the level of water is shown consistently to be such that the manifold is half full.

This manifold 16 in figure 1 shows some dripping water returning to the half full manifold and in figure 2, there is shown the blind bore 14 with the conduit 18 and again the manifold 16 being shown as half full of water.

We now need to analyze how such an arrangement might actually work in practice.

The specification itself does not explain whether the situation shown in figures 1 and 2 are to be taken as during operation or at a first stage in the first start up method but it is illustrative in figure 1 that there is shown a return of condensed water back into the

manifold which would appear then to definitely indicate that it is intended to be showing the system actually in its operation phase.

The most relevant description that appears to exist within the Cavazos specification is in the introductory portion in column 1 and we draw specific attention to lines 47 through 650 which states as follows "I have since discovered that the most efficient cooling is when the heat of the mold is transferred not to a liquid, but to a vapor which is in contact with the walls of the plurality of blind bores."

In other words, although the drawings in the specific description show the liquid in continuous contact with the walls of the blind bores, it does appear clear that, in practice, the system in fact functions, because some or perhaps all of the water is converted to vapor and heat is then transferred by convection, not by phase change. Heat is then removed by heat exchange at the cooled surface of the "condenser," not by condensation.

On relatively straight forward calculations, if all of the water shown in figures 1 and 2 were converted to vapor and presuming that the head space (as illustrated) is similar in size to the initial volume of water, then the temperature that would be required to achieve this condition would be so high that the mold would become quite useless. The pressure created would also be so high that it's containment could present significant mechanical problems.

Because we do not have exact sizes and volumes, the actual figures can only be guessed at but if there were two or three further bores, and this has been suggested at least in the specification, then the volume of water as compared to the head space

becomes greater and we have a further increase in temperature and pressure requirements.

Such an arrangement with such a volume of water being fully converted to vapor would not therefore be physically or economically sensible and there is no suggestion in the specification that there should be facilities made to permit this to happen on such a scale.

If a comparatively small quantity of water was introduced, leaving a much greater ratio of head space to liquid then the complete conversion of liquid to vapor would be much more practical and the convection cooling process, as reported by Cavazos, becomes feasible. His specified 'startup' conditions and procedures then also make more sense.

This being the case, if any unvaporized water is left in the system it will interfere with the free flow of vapor between the mold and the 'condenser', reducing efficiency. This adds further weight to the argument that the proportion of water to head space shown in Cavazos's diagrams is misleading.

Our assessment therefore of how Cavazos would have to work matches almost precisely with the description in column 1 which says that he has found "the most efficient cooling is when the heat of the mold is transferred not to a liquid, but to a vapor which is in contact with the walls of the plurality of blind bores."

Cavazos's invention finished up being a very complicated application of convection cooling using water vapor as the transmission medium.

One needs to recognize the fact that the blind bores and their interconnecting conduits provide perfect conditions for the creation of 'vapor locks' that will prevent water from flowing back into the blind bores. Any water which merely approaches the heated part of the mold will vaporize thereby maintaining the 'vapor lock'. As a result, during operation, the blind bores can only contain water vapor. Cavazos apparently did not have a solution to this problem and chose to accept an inferior default process of cooling by convention.

In summary, Cavazos fails to teach a method of using the latent heat of evaporation of a phase change liquid to control a mold's surface temperature. He provides no lessons on the efficient achievement of uniform surface temperature profiles.

As far as the invention's claims are concerned, the most that Cavazos teaches is a failed attempt to apply the "Heat Pipe" principle to a mold.

COMPARISON OF CAVAZOS AND THE INVENTION

The invention has a chamber which is closed and within the mold. As stated in Claim 19 et al, this chamber is "shaped and positioned together with the level of liquid therein so that the liquid will cover each of the areas in the mold from which heat is to be taken." Figures 1 and 2 clearly show the nature of this "shaping and positioning" which necessarily follows the shape of the molding surface in order to "cover the areas in the mold from which heat is to be taken."

The shaping of the chamber ensures that all working surfaces of the mold surface are services equally by the liquid, resulting in a highly desirable uniform temperature profile across the mold's working surface, a condition which is not obtainable using "a

plurality of blind bores", especially for parts with complex shapes, as set forth in claim 19.

This use of this shaped chamber is fundamental to the present invention and its use in conjunction with the successful use of the "Heat Pipe" principle is Applicant's most important inventive step.

The liquid and head space volumes and pressures are all present so that the liquid will effect the capture of heat from the mold by converting from liquid to vapor (which is a very efficient way of capturing heat). This heat is then transferred by condensation to the condenser.

However, there is use of the specific term "chamber" so that there is implicitly therefore always a return path for condensed liquid to the heated surface that will not be then blocked by vapor locks. Fig. 1 illustrates a case where a conduit provides a path for the condensate to return under gravity to the main chamber. Fig. 2 illustrates another case which includes a chamber which is immune to vapor locks.

Several molds have now been manufactured using the technique of the present invention. These have been rigorously tested and, in contrast to Cavazos, have performed exactly in accordance with the claims and specifications.

Cavazos's use of blind bores and their interconnecting conduits provide perfect conditions for the creation of 'vapor locks' which will prevent water from flowing back into the blind bores. Any water which merely approaches the heated part of the mold will vaporize before reaching those bores, thereby maintaining the 'vapor lock'. Apparently

Cavazos either did not realize that this was happening or, if he did, he failed to find a solution to it. If necessary, the claims can be amended to set forth – free of vapor lock.

The fundamental situation with Cavazos is that it would seem firstly by its own words and also on our analysis of how it must work, that there would have to be a comparatively small quantity of water involved – preferably small enough to be completely vaporized at the mold's operating temperature. The end result is merely a complicated convection cooling technique using water vapor as the cooling medium. Admittedly water vapor is likely to be a more efficient carrier of heat energy than pure air.

Even if Cavazos had solved the vapor lock problems, his use of 'a plurality of blind bores' would still prevent the achievement of a uniform temperature profile across the mold's working surfaces. Cavazos's Fig. 3 illustrates very well this failure of bored holes (which have to be straight) to deal with curved shapes. The neck and the base of the bottle get very little service from the cooling system. Also, between the bored holes, the surface will be hotter than it will be directly opposite the holes.

In contrast, the present invention, because of its use of a shaped chamber has no constraints that would prevent it from uniformly servicing all parts of the molding surface.

Although Cavazos specifies the use of a 'phase change liquid', his technique does not and cannot take advantage of the latent heat properties of that phase change liquid.

While the Examiner is giving no weight to intended use in claims 21 to 24, intended use is essential. Cavazos cannot be used for non-glass products.

Cavazos also has two separate coolants, which is to say primarily vapour as a coolant with very incidental coolant from liquid, all of our claims call for a single coolant so that there is a phase change that ensures an effective coolant effect which is not able to be achieved by the apparatus of Cavazos, and Cavazos's structure is also cumbersome to adjust for the two separate coolants. This clearly distinguishes from the disclosure in column 2, lines 50 to 65 of Cavazos, regardless of how the Examiner interprets it.

With respect to the objection under 103(a) to claims 21 to 24 and 30, there is no clear teaching in Cavazos of the fact that those features can be applied to other areas. Cavazos's teachings, if operable, are clearly related to Cavazos, and no equivalency is disclosed or can be inferred to the apparatus of the present Application.

Reference will now be made to Mr. James' declaration. As noted heretofore, Mr. James who has worked in this technology for many years has a very good understanding of Cavazos and the present inventions. The arguments submitted heretofore were made with Mr. James' input and assistance.

As indicated in the enclosed unsigned declaration, Mr. James has experienced the problems associated with the cooling of molds for many years and has been enormously frustrated that there was no good answer to the problem of keeping the temperature throughout a mold relatively uniform and in so doing, keeping that temperature within an appropriate operating range.

As noted, Mr. James was not aware of any comprehensive solution to this problem that existed anywhere in the world and he states this because, as a part of his professional expertise, he has had to keep up to date with technologies that are available in various countries.

Mr. James has very carefully considered Cavazos as to whether this description as set forth in Cavazos would provide him, as a specialist in the field, with a solution to the problem that he was facing when he invented the present invention as disclosed in this application.

As noted heretofore, the first issue is that Cavazos is dealing with a mold for glass which necessarily operates at a much higher temperature than one would use for molding plastics materials. This is an argument which has been continuously made.

A mold for plastic materials typically operates with surface temperatures of less than 65° Centigrade and there are generally a number of problems associates with plastics materials where uniformity of temperature is important.

When Mr. James first considered his concept and theory, as noted in the declaration, he was not certain that it would work effectively so he constructed an experimental mold which incorporated viewing panels that allowed him to observe the action of the system under simulated operating conditions and which also allowed Mr. James to conduct experiments to determine the relative importance of various structural factors to the effectiveness of the concept.

This developmental work proved the importance of working with a shaped chamber within the mold that provides similar distances for heat to travel from all points on the working surfaces of the mold to the surfaces of that chamber and which reliably provides for the return of liquid from the condenser to those working surfaces within the chamber.

As the liquid absorbs heat, and since very low pressures are involved, comparatively large volumes of vapor are created very quickly, causing a violent boiling effect which very easily drives all of the liquid to the top of the chamber where as Mr. James indicated, the design of the chamber must allow for the liquid to return to the bottom of the chamber so that the process can be continuous.

The problems with Cavazos, as explained by Mr. James, are firstly that there appears to be no way that liquid can be returned to the areas from which heat is to be taken after its initial expulsion by the boiling action and secondly that no attempt is made to create uniform flow paths between the molding surfaces and the cooling system so that even if Cavazos had made effective use of the phase change properties of the liquid, he still does not address the problem of uniform distribution of its effect.

With Cavazos, any liquid that attempts to return would be boiled off before it did so and as the resultant vapor rises through the conduits it blocks any flow of liquid back into the bores (as occurs in the conduit of a coffee percolator.)

When Mr. James was attempting to find a solution to the problems associated with mold cooling he independently considered and rejected a number of concepts based on the 'heat pipe' principle, including concepts similar to that described by Cavazos and had Mr. James then been aware of Cavazos and had Mr. James accepted Cavazos without more, teaching Mr. James is confident that he would have been in fact deflected from finding the solution set forth in this application. Mr. James indicates that the reason he would have been deflected away is that clearly Cavazos had been attempting to keep a mold cool and had specified the use of straight bores in the actual mold, narrow conduits

that were fed to a common manifold and then a quite complex process of controlling the excessive temperatures by controlling the pressures.

As emphasized earlier and as Cavazos shows the system half full of water, one has to assume according to Mr. James that this is the operating condition but, like in a coffee percolator, vapor rising in a conduit prevents water from returning via that conduit.

It is for the aforesaid reasons in Mr. James' opinion, Cavazos does not teach an enabling concept of process that would in any way be beneficial to the problems presented and indeed solved by the present invention.

If anything, Cavazos teaches away or would have been a negative teaching in that Cavazos says near the beginning of his patent that he found that with his system "the most efficient cooling is when the heat of the mold is transferred not to a liquid, but to a vapor which is in contact with the walls of the plurality of blind bores" so clearly by his own words Cavazos does not teach an effective method for the use of the phase change properties of a liquid, and Mr. James is aware that the use of water vapor as conductor of heat is far too inefficient to be useful in a mold which processes thermoplastics.

CONCLUSION

The present invention proposes an answer that is implicitly very much different from Cavazos in that it describes a suitably shaped chamber within the mold rather than "a plurality of blind bores."

Critically however, the present invention does use successfully a phase change heat transfer system where the liquid is facilitated once condensed, to return and therefore

to continually keep those surfaces from which heat is to be taken in contact with the liquid.

Once the present invention sets up the mold, it is expected that the only external input is cooling water through the condenser that in practice then allows for the highly efficient use of cooling water.

Since Cavazos himself failed to present any solutions to the problems that he encountered in attempting to apply the "Heat Pipe" principle to a mold, it is unwarranted to suggest that the present invention's claims are anticipated by Cavazos.

For the reasons above, it is considered that Cavazos does not anticipate any of all of the claims and indeed that it would not lead to the present invention being considered obvious in light of Cavazos.

For the reasons noted above, Applicant requests reconsideration and allowance of all of the Claims.

If the Examiner finds certain points where certain changes are necessary, the Examiner is respectfully asked to call Applicant's attorney for an interview in order to do what is necessary to place the Application into condition for allowance. Early and favorable reconsideration is respectfully solicited.

Respectfully submitted,

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Enclosure
Check for $210.00
Unsigned Declarations

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Attorney

J. Harold Nissen
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December 29, 2003
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